# "Bringing Industry and Government Together"

## a JOINT CHEMICAL SAFETY WORKSHOP
## July 24, 1997

**Bob Bollinger, Center for Chemical Process Safety**

# CENTER FOR CHEMICAL PROCESS SAFETY

**VISION - The Center for Chemical Process Safety (CCPS) will provide leadership in chemical process safety to prevent major incidents associated with processing, storing, using, and distributing hazardous materials**

# CENTER FOR CHEMICAL PROCESS SAFETY

**MISSION** - **CCPS is an industry-driven, non-profit professional organization affiliated with the American Institute of Chemical Engineers (AIChE). It is committed to developing engineering and management practices to help prevent and mitigate catastrophic accidents involving the release of hazardous chemicals and hydrocarbons that could harm employees, neighbors, and the environment.**

**To promote continuous improvement in chemical process safety, CCPS will:**

- **Advance state-of-the-art process safety technology and management practices.**
- **Serve as a premier resource for information on process safety.**
- **Foster process safety in chemical and related engineering education**
- **Promote process safety as a key industry value.**

# CCPS
# 1985-1996

- Born out of crisis
- Industry led response
- A new management system was developed (PSM)
- Endorsed by government
- Accepted and adopted worldwide

# RESULTS OF TEN YEAR EFFORT

- 25 guidelines developed & published
- 10 international symposia
- Network of 92 sponsors
- Experimental research on dispersion testing
- New leading edge methods developed

# WHO ARE CCPS STAKEHOLDERS

- *Sponsors*
- *Customers*
- *Industry*
- *Public*
- *Government*
- *Academia*
- *Chem E's*
- *Trade & professional associations*
- *Continuing Ed*
- *Staff (CCPS & AIChE)*

# CCPS SPONSOR COMPANIES

ABB LUMMUS GLOBAL INC
ABS GROUP
AIR PRODUCTS
AIU ENERGY/STARR TECH
AKZO NOBEL
ALBEMARLE
ALLIEDSIGNAL
AMERICAN HOME PRODUCTS
AMOCO
ARCO
ARTHUR D LITTLE INC
BASF CORP
BATTELLE
BAYER CORP
BP OIL CO
BRISTOL-MYERS SQUIBB
BROWN & ROOT
CALTEX PETROLEUM CORP
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CH2M HILL
CHEVRON RES & TECH CO
CIBA SPECIALTY CHEMICALS
CIGNA
CYTEC INDUSTRIES
DNV
DOW CHEMICAL CO
DOW CORNING CORP
DUPONT CO
EASTMAN CHEMICAL CO
EASTMAN KODAK CO
ELF ATOCHEM N A INC
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LOCKHEED MARTIN
THE LUBRIZOL CORP
3M
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OLIN CORP
PCR INC
PFIZER INC
PHILLIPS PETROLEUM CO
PLG INC
PPG INDUSTRIES INC
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PROCTER & GAMBLE
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REILLY INDUSTRIES
RHONE-POULENC N AMER
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ROY F WESTON INC
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SOLVAY POLYMERS INC
STONE & WEBSTER
SYNCRUDE CANADA LTD
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TEXACO INC
TNO
UNION CARBIDE CORP
US DEPARTMENT OF ENERGY
VULCAN C HEMICALS
WESTINGHOUSE SAVANNAH RIVER CO
WR GRACE & CO

# PSM IN EDUCATION (SACHE)

- **Key audience for PSM (*mission*)**
- **Education - engineers and chemists**
- **CCPS formed SACHE - in 1992**
- **Volunteer effort - by industry and academia**
- **Quality curriculum and materials**
- **96 Chem Eng departments in USA and Canada (of 140+ potential)**

# NEW CONTRIBUTIONS BY CCPS IN SECOND DECADE (1995-2005)

- Forum on hazard assessment research
- PSM for small enterprises (SMEs)
- Integrating process safety, environment, health and quality
- Measuring PSM performance
- Lessons learned database
- Communication
- New Publications
- Equipment reliability database

# CCPS VISION FOR PERFORMANCE MEASUREMENT OF PSM, AND EHS

## Evolution of Performance Measurement Systems

- 35 Technical Guidelines Published - To Prevent Catastrophic Releases of Hazardous Materials
- Technology Alone Is Not Enough
- Technical Management Committee Formed
- Developed a Series of Management System Guidelines for Identification, Understanding and Control of Process Hazards

# PSM GUIDELINES

| Document | Audience |
|---|---|
| "A Challenge To Commitment" 1988 | Senior Executives |
| "Guidelines for the Technical Management of Chemical Process Safety" 1989 | Middle Management |
| "Guidelines for Process Safety Management in Chemical Plants" 1992 | Plant Staff |
| Guidelines for Implementing Process Safety Management Systems" 1993 | PSM Managers |
| "Guidelines for Integrating Process Safety Management, Environment, Safety, Health and Quality" December 1996 | PSM, Env., Health, Safety, Quality Managers |

# CCPS MEASUREMENT OF PERFORMANCE AND EFFECTIVENESS OF PSM

| | | |
|---|---|---|
| PHASE 1 | Developed Methodology for Two Elements of PSM ("Management of Change" & "Training") | 1993 |
| PHASE II | Pilot Tested at Several Plants in US and United Kingdom (Funded by Health & Safety Executive, U.K.) | 1994 & 1995 |
| PHASE 111 | Developed Generic Structure for Measurement of All 12 Elements of PSM - (Funded by DOE) | March 1997 |
| PHASE IV | Complete the Performance Measurement System for PSM | |

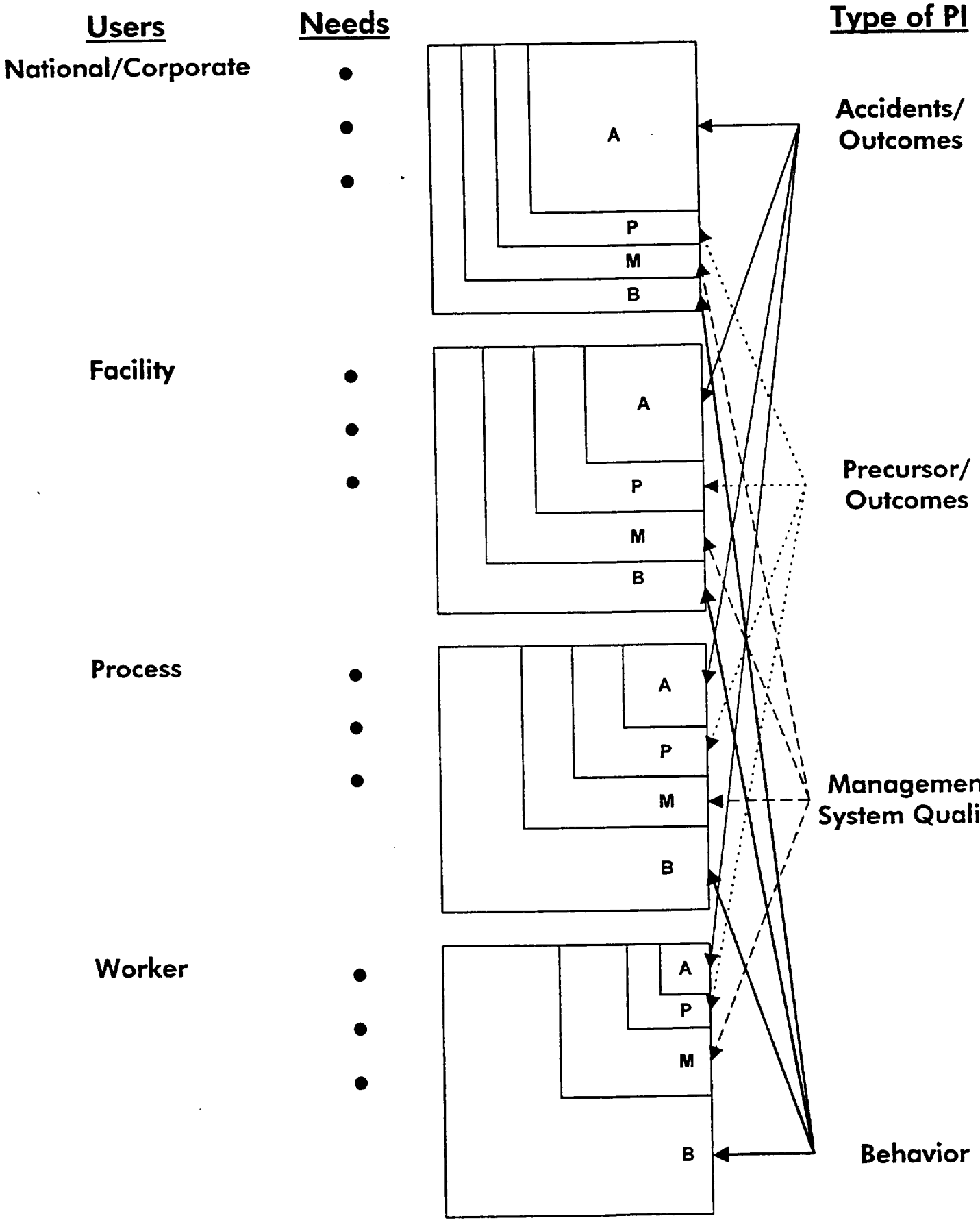
# CCPS VISION FOR PERFORMANCE MEASUREMENT OF PSM AND EHS

- Managements want one management system
- Similar characteristics and definitions
- Similar Goal - "Continuous Improvement"

## FUTURE CCPS PLANS

- Guidelines for Developing Performance Measures for Continuous Improvement of PSM
- Performance Measurement System for PSM/EHS
- Guidelines for Developing Performance Measures for Continuous Improvement of PSM/EHS

# Hierarchical PM Approach



# TYPES OF PERFORMANCE INDICATORS

- Accidents
  - Number of fires/explosions
  - Number of accidental chemical releases
  - Number of injuries
  - Number of spills

## TYPES OF PERFORMANCE INDICATORS (cont.)

- Precursors
  - Near misses
  - Safety system actuations
  - Safety system failures that don't result in an accident

## TYPES OF PERFORMANCE INDICATORS (cont.)

- Management System Quality
  - Indicators of the "health" of the management systems
  - Hazard analyses performed on time
  - % of work requests that are improperly classified as RIKs
  - Δ% of PM backlog items to items completed

## TYPES OF PERFORMANCE INDICATORS (cont.)

- Behaviors
  - One of the most difficult to develop
  - The "Safe Acts Index" developed by the DuPont company
  - Periodic "safety mind set" employee surveys

## POTENTIAL USER NEEDS

- Is the industry getting better or worse in ESH matters?
- What are the most important aspects of facility operations that affect ESH performance?
- Are we focusing our inspection resources on the most important areas?

## POTENTIAL USER NEEDS (cont.)

- Are we applying our resources in the areas in which they are most beneficial for improving ESH aspects of operations?
- Are more resources needed? If cuts are necessary, where can they be made in a way that minimizes the impact on ESH performance?

## POTENTIAL USER NEEDS (cont.)

- Are there areas where we can petition regulators for relief and give regulators and oversight groups confidence in the effectiveness of our ESH management programs?
- On what facilities should we be focusing our efforts for ESH improvement?
- How can I achieve continuous improvement in ESH matters?

## POTENTIAL USER NEEDS (cont.)

- How effective is our ESH implementation?
- What are the weakest areas in our ESH management systems?
- Although we have not had any major accidents, how "close to the edge" are we?
- How do my actions affect the overall ESH performance of the facility/company?

## CCPS TECHNICAL MANAGEMENT SUBCOMMITTEE

- Thomas Selders, *ARCO Chemical Company*
- Thomas Rodante, *Caltex Petroleum Corp.*
- Sandy Schreiber, *CCPS/AIChE*
- Robert Bollinger, *CCPS/AIChE*
- Jeff Gunderson, *Chevron Research & Technology*
- Raymond French, *Exxon Chemical Company*
- William Helmer, *Hoechst Celanese Corporation*
- Gary Hagan, *Lockheed Martin Energy Systems*
- E.J. Ryczek, *Merck and Company*
- Wayne Scheimann, *Nalco Chemical Company*
- C. Robert West, *PPG Industries*
- Stanley Anderson, *Rohm and Haas Company*
- Murray Smart, *Syncrude Canada Ltd.*
- Alfred Bickum, *The Goodyear Tire & Rubber Co.*

## PAST MEMBERS OF TECHNICAL MANAGEMENT SUBCOMMITTEE

- Jack Dowbekin, *Exxon Chemical Company*
- Joe Sweeney, *ARCO Chemical Company*
- Dennis Wade, *Monsanto Company*
- Art Burk, *Dupont Company*
- John Murphy, *The Dow Chemical Company*
- Bill Fraser, *Merck and Company*

PSM
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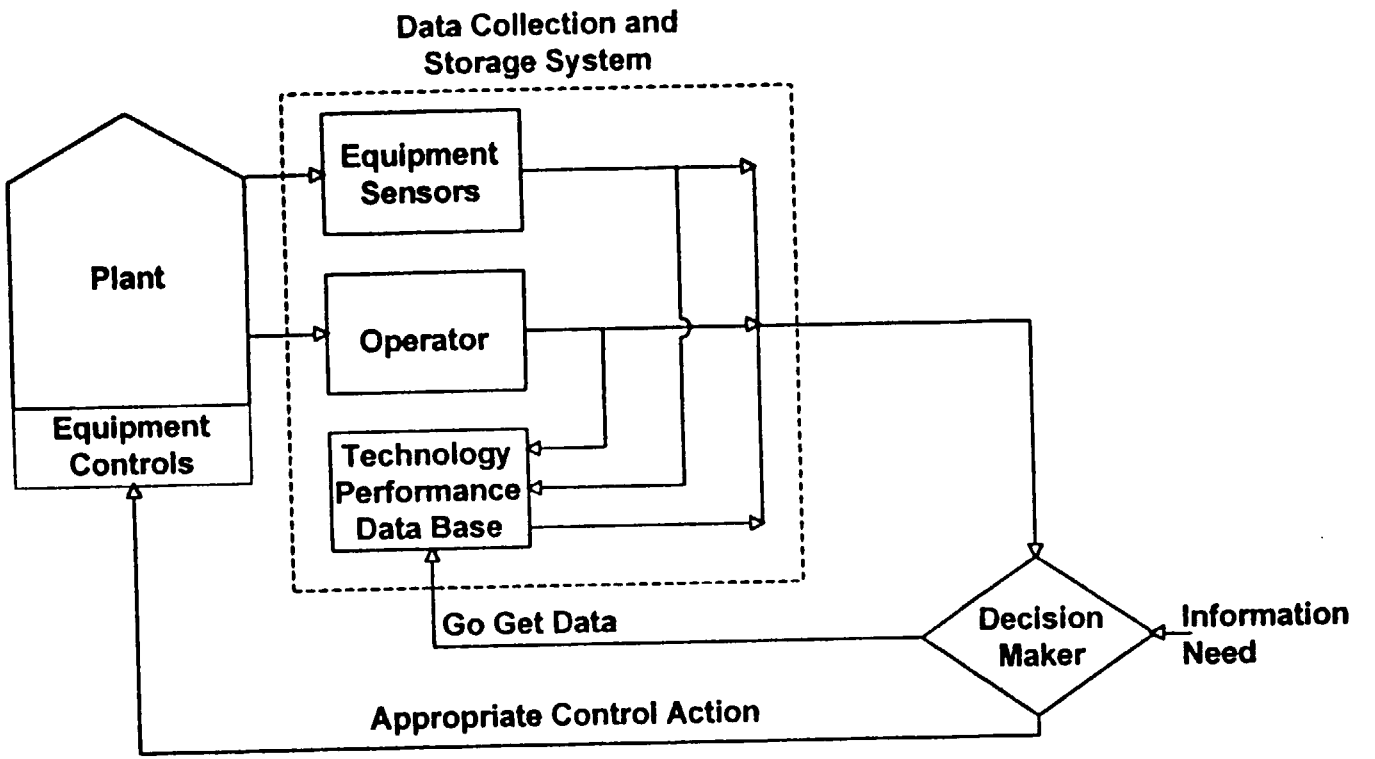
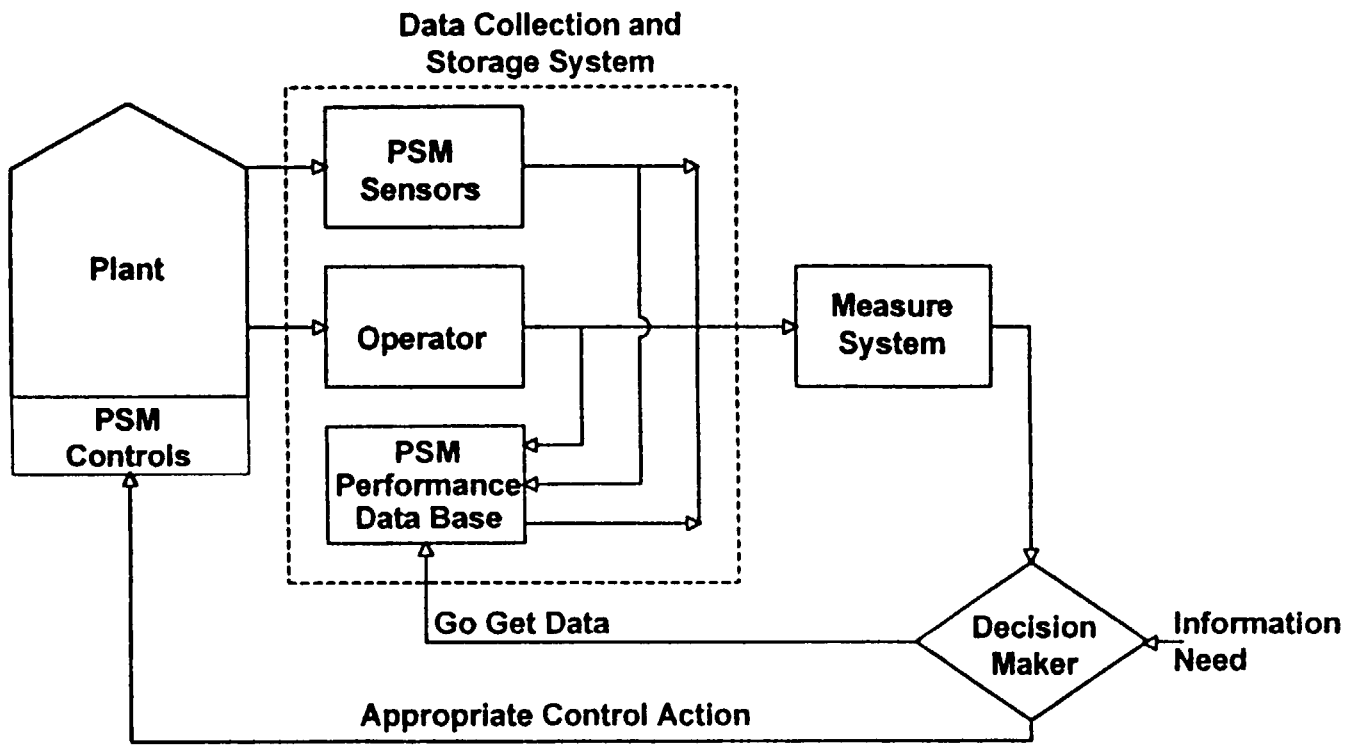
LESS
MORE
PROCESS SAFETY
PSM

# TECHNOLOGY CONTROL SYSTEM



# PSM CONTROL SYSTEM



## OBJECTIVES OF THE CCPS PSM MEASUREMENT SYSTEM

- Continuously useful
- Not expensive to use
- "Culturally" acceptable
- Provide near-real-time feedback
- Integrate Total Quality concepts
- Be adaptable to different PSM structures

## BENEFITS OF A PSM PERFORMANCE MEASURE

- Reduce risk of accidents
- Improve cost effectiveness of PSM activities
- Benchmark against PSM performance expectations
- Justify that PSM resources have been wisely invested
- Help establish priorities and baselines for continuous improvement

# PSM PERFORMANCE MEASUREMENT PROJECT

- 5-year project (1992-1997)
- to measure PSM performance based on management process rather than outcome (accident rate)
- complex process - correlating performance vs criteria for success
- "calculator" contains measurement technique, based on interview & data
- Multiple funding: (1) CCPS, (2) HSE, (3) DOE; (4) more funds needed

# MEASURING PSM PERFORMANCE

- To improve any kind of performance, measurement is needed
- A new CCPS methodology based on systems assessment
- Phase I includes 2 elements of PSM (MOC and training)
- Phase II will include all 12 elements
- Two software products expected
- Funded by CCPS, HSE, DOE and others